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## PELLAGRA: A REPORT ON AN EPIDEMIOLOGIC STUDY.

By R. M. Grimm, Assistant Surgeon, Public Health and Marine-Hospital Service.

During September and October, 1911, the vicinities of Spartanburg, Chester, and Rockhill, S. C., were visited for the purpose of collecting data on the epidemiology of pellagra. The gravity of the pellagra situation in the vicinity of Spartanburg had been realized by the physicians and others. The other two communities were visited at the suggestion of the secretary of the State board of health of South Carolina. The work covered by this report consisted entirely of the collecting of facts and the recording of observations largely of an epidemiologic nature; comments and discussion of these facts are at present considered premature and have been purposely avoided.

While engaged in this work an attempt was made to see and to study as many cases of pellagra as possible and to collect any data which might have a possible bearing on the disease and which might possibly shed some light on its etiology. It was thought possible that some fact or circumstance might be found to be common to a number of cases which would suggest some more or less promising line along which further intensive studies could be made. It would have been desirable to report here upon the total number of pellagrins in any one or all of the vicinities visited, but the practicable impossibility of determining their number was evident from the fact that there were known to be pellagrins in the various communities who had not consulted a physician. Such a determination would have necessitated the taking of a census of the entire population of the community. The local practicing physicians were depended upon entirely for locating and reporting cases. It was the kindness and cooperation of the local profession that made it possible for me to collect the data included in this report. With the assistance of the various local physicians I was able to collect a series of 380 cases of pellagra (series SCY). These cases were distributed among the three vicinities as follows:

From Spartanburg and vicinity.....	202
From Chester and vicinity.....	79
From Rockhill and vicinity.....	99
Total.....	380

This report is made up only from the data pertaining to this series.

A 5 by 8 inch card was used for recording data in each case, which in conjunction with a supplementary blank was found to be fairly satisfactory. The two sides of the card are shown here and are self-explanatory. In this way notes were obtained upon the 380 cases of pellagra, including cases personally visited and cases and deaths reported to me.

FACE OF CARD.

Series Case.....	Name.....	Address.....	Date.....
Seen with.....	Note.....	Diagnosis.....	
Reported by.....	Nativity.....	Occupation.....	
Age.....	Sex.....	Race.....	PELLAGROUS (present attack)
FAMILY.....			
	PERSONAL.....	Date of onset.....	
		Residence at.....	(State)
		(Town)	
		Number and health of family.....	
Children.....	Marriage.....		
		Food.....	
		Water supply.....	
Remarks.....	Residences.....	City, Town, Rural.....	
		Relation to water courses.....	
		Remarks.....	

## REVERSE OF CARD.

## PELLAGROUS (First Attack)

Date of.....

Residence at.....

Number and health of family.....

Relation to other cases.....

To heredity.....

To animals.....

Food.....

Corn.....

Water supply.....

To watercourses.....

.....

.....

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## ENVIRONMENT AND CONDITIONS

Topography.....

Location of house—City, Town, Rural.....

Economic.....

Sanitation.....

Watercourses .....

Water supply.....

Remarks.....

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.....

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With reference to race and sex these cases were as follows:

	Cases visited.	Cases reported.	Deaths reported.	Total of group.	Percent- age of whole.
White females.....	61	127	58	246	64.8
White males.....	19	58	18	95	25.0
Colored females.....	1	12	8	21	5.5
Colored males.....	2	3	5	10	2.6
Unclassed.....		8		8	2.1
Total.....	83	208	89	380	100.0

The 83 cases personally visited according to age were as follows:

Age group.	White.		Colored.		Total.
	Females.	Males.	Females.	Males.	
0 to 10 years.....	5	6		1	12
11 to 20 years.....	5	2			7
21 to 30 years.....	22	2			24
31 to 40 years.....	12	1	1		14
41 to 50 years.....	10	1			11
51 to 60 years.....	6	4		1	11
61 to 70 years.....	1	2			3
71 to 75 years.....		1			1
Total.....	61	19	1	2	83

Of this number, 53 were married, 21 were single (including 12 children), and 9 were widowed.

#### CONSIDERATION OF CASES VISITED.

*Environment and conditions.*—The counties visited are located in the Piedmont section of South Carolina, between the lower tidewater country on the east and the higher mountainous section on the west. Between the tidewater and the Piedmont sections there is a line of falls stretching across the State in a northeast-southwest direction. This is locally known as the "fall line," and it is from north of this line that most of the cases of pellagra in the State have been reported. The towns of Spartanburg, Chester, and Rock Hill are located above this line, but lie east of the mountains. Their elevations above the sea level are 875, 539, and 664 feet, respectively. The topography of the country here is hilly and offers good natural drainage. The many streams are usually swiftly flowing and have numerous falls. Running streams are abundant in these counties, and it is impossible for the people to live any great distance from some one of them. None of the pellagrous homes that I visited were located more than a half mile from a stream, and in the majority of cases there was a stream 200 or 300 yards from the house. The cotton-mill villages visited were found located in the vicinity of some running water. This was a common observation.

The locations of the homes of the cases personally visited were as follows:

In a cotton-mill village or in the cotton-mill section of a town.....	70
In a town, but not in the cotton-mill section.....	7
In the country.....	6
Total.....	83

The cotton-mill workers, among whom so many of the cases of this series occurred, appeared to be poor, overworked, and underfed. They were found living in cottages located around the mills in which they were employed. These little villages are usually well looked after by the mill operators, but the authority of the mill operators does not extend to the interior of the homes, where in many instances were evident the signs of poverty and extreme neglect. With the exception of a very few, it can be said that the general hygienic conditions of the homes visited among this class were uniformly bad. Specimens of the ordinary bed bug were collected from several of the homes by a tactful family physician, and in very few of them, indeed, were conditions such as to lead one to suspect the absence of this parasite.

A condition which adds greatly to the complexity of the pellagra situation among this class of people is that they seem to live at one place only for a short time. They are continually moving from one house to another in the same village, or from one village to another. Of the 83 cases seen only 40 were then living in the same house in which they developed the first symptoms of the disease. The remaining 43 had resided at various places since their first attack. Many of the cotton-mill workers of western South Carolina are natives of the mountains of North Carolina, who have moved to the cotton-mill villages, as the cotton mills offered them a better means of livelihood than the mountains of their native State. In several instances it was learned that the first symptoms of pellagra had developed in these persons shortly after they had moved from the mountains to the environment of the cotton-mill village.

Of this series of 83 cases visited there were 16 who did not belong to the cotton-mill class. Among these there were three female pellagrins who seemed to be in good economic circumstances, to be living under good sanitary conditions, and appeared to be neat and cleanly housekeepers.

The majority of the pellagrins were living in unscreened houses, but the exact number was not determined with reference to this point. In several of the communities visited, mosquitoes were found to be plentiful.

*Occupation.*—The occupation of the 83 cases seen was found to be as follows:

Cotton-mill people:	
Cotton-mill workers.....	17
Housework.....	38
Children.....	12
Farmer.....	1
Farmers' wives.....	4
Railroad man.....	1
Stonecutter.....	1
Housework (not mill people).....	9
Total.....	83

*Food.*—The subject of diet in these cases proved under the circumstances to be too complex to furnish much definite information. The cotton-mill people obtain much of their food from the stores kept by the mill companies, but other stores are also patronized. The sources of food in these cases were found to be varied. Packed meats and canned goods figure largely as articles of diet, fresh vegetables to a limited extent only, and fresh meats to a variable extent. Generally speaking, the food used in the families of the pellagrins

visited among this class was found to be largely imported and to consist of very few home-grown products.

Each one of the 83 pellagrins whom I saw gave a history of having used corn products more or less regularly as an article of diet, either as corn bread, "grits," or in some other form. Corn bread is used extensively in this section of the country and in recent years has been made largely from imported meal. On account of the passing of the old gristmill, to which the farmer took his corn and had it ground, the meal now used is chiefly that which has been ground at some of the large mills of the country and shipped out in large quantities. This kind of meal has been used by all of the 83 pellagrins excepting one. The exception was a farmer's wife, who stated positively that for years she had used only corn raised on her husband's farm. Her husband, however, kept a little "crossroads" store, stocked with the usual array of cans and boxes. It is needless to say that the store was drawn upon to furnish the family larder. No systematic examination of the meal used in these families was made, but it was learned that several lots which had been received at the stores of the cotton-mill companies had been condemned on account of the high degree of acidity which they showed.

*Water supply.*—The sources of water supply of the families in which these 83 cases occurred were found to be as follows:

Well:	
Driven.....	32
Dug.....	25
City supply.....	7
Well and city supply.....	6
Well and spring.....	6
Spring.....	4
Varied.....	3
Total.....	83

*Heredity.*—Practically all of the information obtained regarding these cases has no bearing, or is negative, on this point. The pellagrous mothers and the pellagrous children in this series are grouped below with reference to the condition of the children or mothers, respectively. Only children under 10 years of age are here considered and of the pellagrous mothers only those now having children which were born at or after their first attack of pellagra.

A. Pellagrous mothers.	
(a) With healthy children.....	5
(b) With pellagrous children.....	1 2
B. Pellagrous children.	
(a) With healthy mothers.....	10
(b) With pellagrous mothers.....	2 2

*Domestic animals.*—No relation could be found between any of the cases in this series and any of the domestic animals or diseases occurring among them. The one family having 4 cases kept 4 goats, which were apparently healthy.

*Relation of cases.*—In many instances the relation of one case to another was found to be varied and often complex. These relations can not be given in detail, but the following classification of them is fairly inclusive:

<sup>1</sup> Children same as "b" in other group.

<sup>2</sup> Ages 4 and 7 years at onset of first symptoms.

A. Case relation in the family (in the same house).	
Having 1 case at time of visit.....	61
Having 2 cases at time of visit.....	8
Having 3 cases at time of visit.....	3
Having 4 cases at time of visit.....	1
B. Miscellaneous relations, including case relations in the family and others.	
(a) No known relation to another case of pellagra.....	17
(b) Previous to onset having had temporary association with a pellagrin.....	9
(c) Onset while living in the immediate vicinity of a pellagrin.....	37
(d) Onset while living in a house with a pellagrin <sup>1</sup> .....	17
(e) Onset while living in a house previously occupied by a pellagrin of another family.....	3
Total.....	83

## CONSIDERATION OF WHOLE SERIES.

*Incidence, etc.*—I was unable to determine with any degree of accuracy the dates at which pellagra made its appearance in these vicinities. The earliest case in Spartanburg County now recalled by the physicians whom I saw seems to have been in the person of a white female living at Enoree on the Enoree River in 1893. The disease was not recognized at this time, but physicians who saw the case are now convinced that it was pellagra. A case is reported to have occurred at Cherokee Springs along a tributary of the Pacolet River in 1891, but I was unable to see the physician who had charge of the case. Physicians now recall having seen cases in other parts of the county before the time of the recognition of the disease and are now confident that they were seeing unrecognized pellagra. In 1904 two females died in Chester County of a disease which was diagnosed as pellagra at the time by Dr. H. E. McConnell, but no report of this observation was made. As far as I was able to determine the first published diagnosis of pellagra in the vicinity of Rock Hill, York County, was made in the spring of 1908. However, unrecognized cases had occurred there before that time. Numerous new cases have appeared from time to time in each one of these counties since the existence of pellagra was recognized there, and apparently each successive year has furnished a larger number of new cases than the year preceding.

The date of onset of the first symptoms of the disease was ascertained in each one of the 83 cases personally visited and in 165 of the cases reported to me. These cases are grouped below with reference to the date of onset:

Date of onset.	Cases visited.	Cases reported.
	<i>Number.</i>	<i>Number.</i>
1911.....	38	78
1910.....	26	44
1909.....	5	16
1908.....	6	6
1907.....	3	6
1906.....	1	4
1905.....	2	3
1904.....	0	4
1903.....	0	4
1902.....	1	0
"Many years ago".....	1	.....
Total.....	83	165

<sup>1</sup>Included in group "A" above.



*Mortality and insanity rates.*—As has been said, the series of 380 cases includes 89 deaths from pellagra. This gives a mortality rate of 23.8 per cent for the series. A number of the cases visited showed at the time, or gave a history of, some slight mental symptoms, as depression, etc. One of this number was insane and has since been committed to the State hospital for the insane at Columbia. Of the whole series 18 had become insane after the onset of the pellagrous symptoms, which gives a rate of 4.8 per cent for the incidence of insanity among the pellagrins in this series of 380 cases. Practically all of these 18 insane cases had been confined, at least for a time, in the State hospital for the insane. Some of these have remained there, while others have returned to their homes much improved.

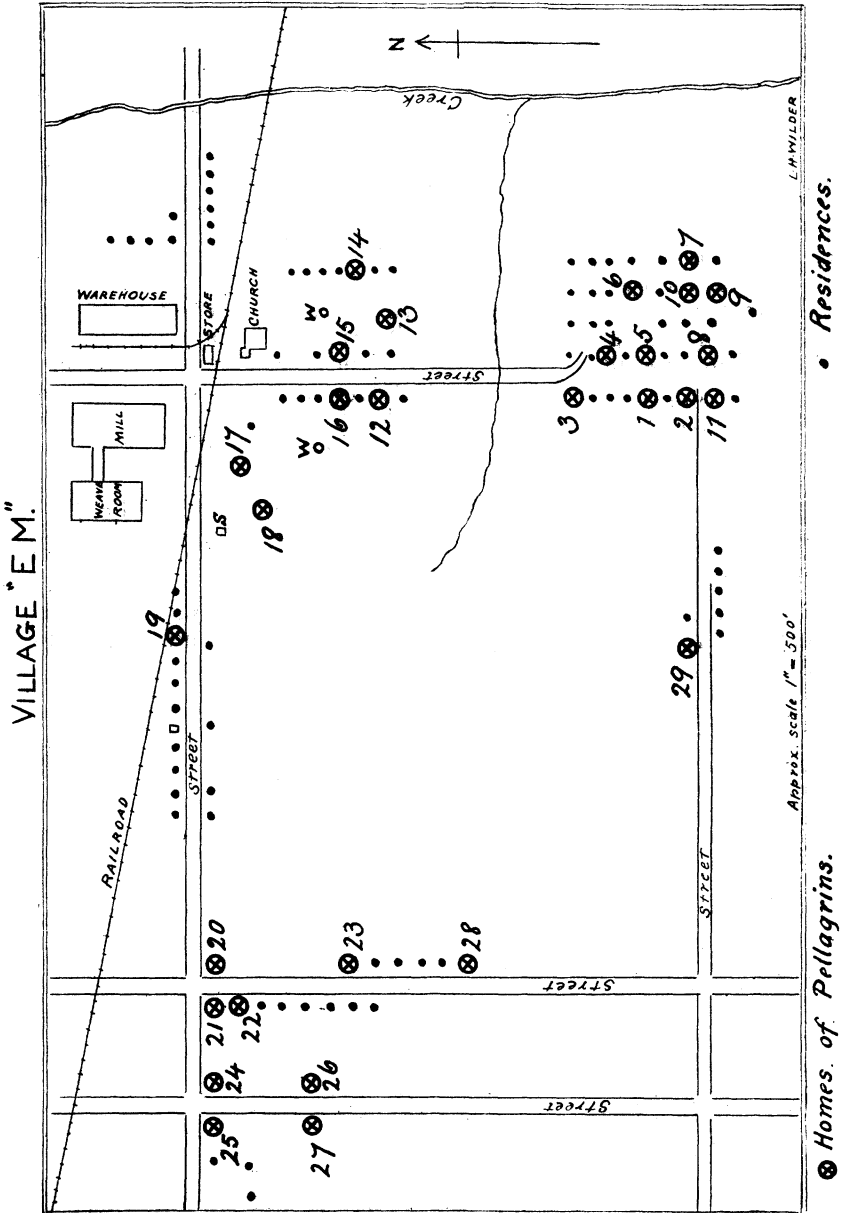
#### CONSIDERATION OF VILLAGE "EM."

One little cotton-mill village in Chester County proved to be of special interest. This was largely due to the fact that the pellagra situation there had been followed from its beginning up to the present time (October, 1911), and all of the cases developing there had been seen by one physician, Dr. H. E. McConnell, of Chester, S. C. About 25 cases of pellagra are known to have developed while living in this village, some of whom are still residing there, while others have moved away or have died.

A rough map of this village, designated "Village EM," is given here. The eastern half of the map represents the cotton-mill village proper and the western half a part of the suburbs of a neighboring town. The population of the area represented in the map is approximately 500, but of this number some are moving in or moving out all the time. The dots in the map are intended to show the locations of residences and the crosses with a circle around them are intended to represent the location of homes of pellagrins. The two groups of houses south of the mill are each situated on a slight elevation. A small stream flows between these two elevations and into a creek about 300 yards distant. I was told that no case of pellagra had been known to develop in the little group of houses represented in the northeast corner of the map.

The homes of the pellagrins have been numbered for the sake of reference. Some notes are given below which refer to houses with corresponding numbers:

1. Case 250, developed pellagra here in 1904. Died.
- Case 257, of a different family, developed pellagra here in 1911.
2. Case 249 developed pellagra here in 1904. Died.
3. Cases 227 and 228 (brothers) developed pellagra here in 1909.
- Case 254 developed pellagra here in 1911.
4. Case 205 developed pellagra here in 1909.
5. Case 253 developed pellagra here in 1909.
6. Case 252 developed pellagra here in 1910.
7. Case 251 developed pellagra here in 1910.
8. Case 251 lived here after onset of disease.
9. Case 214 developed pellagra here in 1911.
10. Case 214 lived here after onset of disease.
11. Case 225 developed pellagra here in 1911.
12. Case 204 developed pellagra here in 1910.
13. Case 255 developed pellagra here in 1910.
14. Case 231 developed pellagra here in 1910.
15. Case 256 developed pellagra here in 1910.
16. Case 203 developed pellagra here in 1911.



17. Case 207 developed pellagra here in 1910.
18. Case 223 developed pellagra here in 1911.
19. Case 206 developed pellagra here in 1911. New House.
20. Case 281 developed pellagra here in 1906.
21. Case 278 developed pellagra here in 1910.
22. Case 278 now living here.
23. Case 241 lived here in 1907.
24. Case 233 developed pellagra here in 1910.
25. Case 232 developed pellagra here in 1910.
26. Case 277 developed pellagra here in 1907.
27. Case 277 now living here.
28. Case 235 developed pellagra here in 1911. Died.
29. Case 211 died of pellagra here in 1911.

I am greatly indebted to Dr. H. E. McConnell for his kindness and assistance rendered in locating cases of pellagra and in obtaining facts of the histories of the houses noted above. Much of the data was given to me by Dr. McConnell himself.

Mosquitoes are prevalent in this village, and screened houses are the exception. A number of the pellagrins here stated to me that bedbugs were present in their homes, but no specimens were collected. The water supply is obtained from driven wells located at various places throughout the village. Much of the food used by these people is obtained from the store located near the railroad switch, but other stores are also patronized.

It may be of interest to state here that Mr. W. V. King, of the Bureau of Entomology, United States Department of Agriculture, stated to me that he had collected specimens of the larva of the fly *Simulium* from the water of the little creek to the east of the village.

In conclusion, I wish to thank the many physicians of Spartanburg, Chester, and Rock Hill who, by their kindness and cooperation in this work, greatly assisted me in collecting the data which has made this report possible.